

## A Duckbill Out of Water

In his response to Robert Bakker's article, "How Dinosaurs Invented Flowers" (November 1986), William Morris asserts that the duckbill dinosaur's beak was built for filtering aquatic organisms ("Letters," February 1987). In so doing, he ignores the goose's fluted bill, which is very like the duckbill's, yet geese are terrestrial grass eaters. Morris also fails to mention the duckbill's fantastically well-developed grinding dental batteries, a serious omission because such teeth are found only in eaters of tough land plants, *never* in living filter feeders, which do not need them. If duckbills were filter feeders they probably would have been toothless—like blue whales and flamingos. Duckbills may have occasionally grazed upon aquatic plants, but their teeth prove they were land herbivores.

The duckbill's weakly muscled, stiff tail was not adequate for swimming. Other terrestrial adaptations in duckbills include their extremely short fingers and

toes, exactly the opposite of those found in mud-walking and swimming animals. Skin impressions and footprints show that, contrary to past opinions, duckbill hands and feet were not webbed. One interesting thing that I rediscovered (it had been published more than once earlier in this century) is that the American Museum's duckbill mummies show that they had long, deep, vertical skin folds around the shoulders. Hardly the streamlining that one expects in swimmers. Finally, Morris's claim that hollow-crested duckbills are found exclusively in river delta environments is incorrect; they are also known from highland areas. Simply put, duckbills show no more adaptations for an aquatic existence than do deer or black rhinos and probably spent about the same amount of time in the water. There is little doubt that, as Bakker explains, they must have had a strong influence on the evolution of land plants at that time.

GREGORY S. PAUL  
*Baltimore, Maryland*